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The Most Fundamental Tool of Human Thought: THE TRANSCLOSIVE PARALLEL MULTIMEDIA EDITING SYSTEM

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INTRODUCTORY REMARKS

Basically I have had only one idea in the computer field, but in thirty-two years I have come up with several variations on it.

Trying to get this one idea implemented in many different variations has been my principle work for three decades.

Today I would like to explain that one idea. I have never been able to explain the full idea before except to a few close colleagues; each generation of computer people thought I was talking about something different. But I think this group will have little difficulty with the idea.

The idea is not the idea of hypertext or hypermedia, although I am best known for those ideas and those words. The idea is not that of a world publishing respository with fine-grain transclusion and royalty, although that is what I am working now. But the publishing system is just a consequence of that other thinking.

Different Names for It

I have called this idea many things. One favorite was the Thinkertoy, but that never caught on. Recently I have simply called it the Most Fundamental Tool of Human Thought.

To this group, however, I would call it the Transclusive Parallel Multimedia Editing System. I have designed many variants on it since 1960.

What I Was Thinking About

I came out of college calling myself a writer, but I took writing as a model for all other creative and analytic thought: working on complex structures and considering their alternatives.

I was interested in many interlocking subjects, and deeply frustrated by the fact that one note could not simultaneously be filed under all the different subjects and seen in each context simultaneously.

So here were my concerns, as of 1959:

- 1. How can we try out alternatives?*

Alternatives of writing are my model for all other alternatives, including design, planning, negotiation, theory construction, program debugging.

2. We work with *items*. (I early worked with file cards.) We can in principle break anything down into items or constituents. Very well; *how can an item be in more than one place?*

3. How can we consider different versions in parallel? We want to consider alternative structures and *have the differences (or similarities) highlighted*.

The Major Design Fusion

I took a computer course starting in about September of 1960, and I saw the computer as the solution to all these problems.

My idea was this:

An item should simultaneously be filed in many different structures and seen in each context simultaneously. (Usually I visualize this as parallel texts side by side, with the same item highlighted in each, but that is only one model for guidance.

Linkages of other types would bind the different structures as well.

ONE BASIC STRUCTURE: visualize it as parallel strips of some kind, with two relations on it. The details of these parallel strips and their relations have varied in the different implementations. I have given this a great deal of thought for two-thirds of my life, and I am still fascinated by the simplicity of this synthesis as a possible solution for so many problems. Unfortunately, it has been extremely difficult for me to persuade others of this idea.

The Problem Restated in The Light of the Solution

The single-user issue is **DEEP CONSIDERATION OF VERSIONS, PLANS, ALTERNATIVES**.

The result has been my many designs for single-user thinkertoys.

The multi-user issue is **HOW COMPARE, ANNOTATE AND WORK WITH LARGE PROBLEMS IN COLLABORATION?**

The result has been the large-scale servers, especially the 1988 and 1993 versions.

The global issue is: **HOW SAVE AND MAKE AVAILABLE ALL PUBLISHED MEDIA, MAINTAIN COPYRIGHT AND ALLOW NEW USES?**

The result has been the Xanadu publishing schemes, 1960 to the present, with transclusive royalty.

SUCCESSIVE DESIGNS

Zippered lists and Evolutionary List File. (1965)

I described these in my first 1965 paper, "A File Structure for the Complex, the Changing and the Indeterminate," and everything I have done since is mere refinement.

Think of these as being like multiple outliners side by side, in which shared items may be highlighted in some way. Even now this would be a powerful product in personal software.

Xanadu Parallel Textface* front end (circa 1968, pub. 1974).

This was a user front end highlighting similar materials and connections. Transclusions were originally marked simply as a pointer between the beginnings.

Parallel-strip text data server design (circa 1970).

Conventional methods, designed to support the Parallel Textface.

New Technology

At this point I made a certain fundamental discovery, still proprietary to XOC, Inc. and Memex, Inc., called the Enfilade, which has been extended into General Enfilade Theory by others. Rights to publish this before the year 2000, but not before 1995, have been granted to others.

Nelson enfilade substratum, 1972. (Still proprietary to XOC, Inc. and Memex, Inc.)

Implemented by Cal Daniels and John Ridgway.

William Barus Xanadu design, 1974. (Still proprietary to XOC and Memex, Inc.)

A fine-grain transclusive server designed by William Barus and extending enfilade technology, this extended the enfilade into new linking and transclusive structures.

LM design, 1981-8. (Still proprietary to XOC and Memex, Inc.)

A fine-grain transclusive server designed by Mark Miller, Roger Gregory and others in 1979-81, based on proprietary enfilade technology.

Mark Miller and Roger Gregory design, 1981 (completed but not productized under sponsorship of Autodesk, Inc., 1988). Described in *Literary Machines* and now often referred to as "the 1988 version."

XOC 1993 (Still proprietary to XOC and Memex, Inc.)

An extremely powerful fine-grain transclusive server designed by Mark Miller, Roger Gregory and others in 1979-81, based on proprietary enfilade technology. Designed by Mark Miller, Dean Tribble and Ravi Pandya.
(Documentation available below.)

RECENT DESIGNS (non-proprietary technology)

Vortex* system

Co-designed with Stuart Greene and others. Originally designed for Datapoint (1981-2). This was a high-power multistrip server representation for text that support very fast screen scrolling and links, and had the potential of becoming a generalized data structure for other applications.
(Described in *Computer Lib.*)

ZigZag* personal data system (specifications still under nondisclosure).

A design representing a peculiar generalization of zippered lists in a different direction. Includes in one visualization the equivalents of spreadsheet, database, outlining and scheduling.

Dimensia* component software system (specifications still under nondisclosure).

This extends the ZigZag design with a programming language and compound tools.

XANADU LIGHT

This is a proposed data structure and public-access publishing scheme using conventional database technology to support large-scale transclusive publishing with royalty. When the XOC 1993 software becomes available, it will join the service mix.

TO THE OPERATING SYSTEM--

All of these designs have been done at the application level, but I always intended them to be at the operating system level.

FLAWS OF THE FILE MODEL

In particular, the model of disconnected "files" as we know them is never questioned but seriously flawed--

Repeated saving of redundant material in successive versions

No indication of use of the same material in different files

Tendency to impose structure on applications. (My Datamation piece.)

ALTERNATIVE TO THE FILE MODEL.

What is the alternative to the file model? Why, linkage and transclusion among saved objects.

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